The weight changes of steer and heifer calves are shown graphically in Figue 1. It is apparent that essentially no gain was made the first week. Both sexes exhibited the greatest weight gain the second week. During the third week the heifers made essentially no gain while steers exhibited a rate of gain of about 50 percent of that observed during the previous week. These data suggest that one week may not be sufficient to recover or exceed weaning weight. Therefore, at the end of two or three weeks weights could be comparable to those at weaning.

There are numerous factors that should be studied in conjunction with pre-weaning and pre-conditioning of beef calves (i.e. vaccinations & parasite control). Therefore, a total program must be designed to properly pre-condition calves.

Seasonal Variation in the Composition and Digestibility of Midland Bermudagrass

J. E. McCroskey, N. E. Brackett and Robert Renbarger

Story in Brief

The seasonal variation in *in vitro* dry matter digestibility and certain chemical constituents are presented for samples of Midland bermudagrass taken at the Fort Reno Experiment Station during the years 1966 and 1967. Chemical analyses determined were crude protein, neutral detergent solubles, neutral detergent fiber, acid detergent fiber and acid detergent lignin. Also, samples were analyzed for percent calcium, phosphorus, magnesium and potassium.

The data indicate a positive relationship between neutral detergent solubles (cell contents), crude protein and *in vitro* dry matter digestibility. There is a negative relationship between dry matter digestibility and all three fiber fractions. It appears that Midland bermudagrass is a high quality forage for only about the first sixty days of the growing season.

Introduction

Bermudagrass continues to play an ever increasing role as a forage for beef cattle in Oklahoma. Its rapid and widepread acceptance across the state has resulted from its ability to produce a large amount of forage and withstand heavy grazing pressures. Much is known about the fertilization requirements and expected dry matter yield but the data are rather limited on its composition and nutritive qualities.

This report presents an average of two years' data on the composition and *in vitro* dry matter digestibility of Midland bermudagrass samples collected monthly at the Ft. Reno Experiment Station during the years 1966 and 1967 as a part of Project S1220. In 1966, two-hundred pounds of nitrogen was applied per acre in three equal applications during the spring and summer months. In 1967, one-hundred fifty pounds of nitrogen and 50 pounds each of phosphorus and potassium were applied per acre. The phosphorus and potassium were applied in one aplication in the spring whereas nitrogen was divided into three equal applications.

Procedure

Shown in Table 1 are some chemical constituents of the forage and values for *in vitro* digestibility of dry matter by months. The values for neutral detergent solubles (NDS), neutral detergent fiber (NDF), acid detergent fiber (ADF) and lignin were determined according to the procedures developed by Van Soest (1963 and 1967) for evaluating forages. Using these techniques the forage is divided first into cell contents (NDS) and cell-wall constituents (NDF). The NDS fraction represents

Table 1. Seasonal Variation in Chemical Composition and in Vitro Dry Matter Digestibility of Midland Bermudagrass (2 Yr. Average)

Month	Crude Protein	N.D.S. (cell contents)	N.D.F. (cell walls)	A.D.F.	Lignin	In Vitro D.M. Digest.
	% of Dry Matter					
January	5.6	21.4	78.6	45.5	6.1	37.5
February	6.6	23.7	76.3	44.1	6.1	39.6
April	24.2	50.3	49.7	23.1	2.8	70.2
May	20.6	33.6	66.4	31.0	3.8	67.3
June	16.9	30.0	70.0	34.2	4.3	59.9
July	13.2	27.7	72.3	34.4	5.1	58.1
August	13.4	22.6	77.4	37.1	5.0	54.8
September	13.8	25.4	74.6	35.2	4.8	57.8
October	12.1	23.3	76.7	35.0	5.2	52.7
November	8.2	25.8	74.2	37.4	5.3	45.1
December	7.1	22.2	77.8	40.9	6.0	44.1

the easily digested and more soluble parts of the forage (starch, sugars, protein, fat etc.), whereas NDF contains the less digestible, high fiber, cell-wall constituents (cellulose, hemicellulose, lignin etc.). The ADF fraction includes primarily cellulose and lignin. From the ADF fraction lignin is determined by treating with sulfuric acid. Dry matter digestibility was determined in the artificial rumen according to the method of Tilley and Terry (1963). Samples were digested for 48 hours in the artificial rumen then subjected to pepsin digestion for an additional 48 hours.

Results and Discussion

Most forage researchers consider these chemical determinations and this *in vitro* technique to be among the best laboratory techniques available for evaluating forages. Animal gain data are not available for these forage samples but most forage researchers agree that *in vitro* digestibility values are rather closely correlated with animal response. Therefore, some of the analyses values are compared with *in vitro* dry matter digestibility values in Figures 1 through 4.

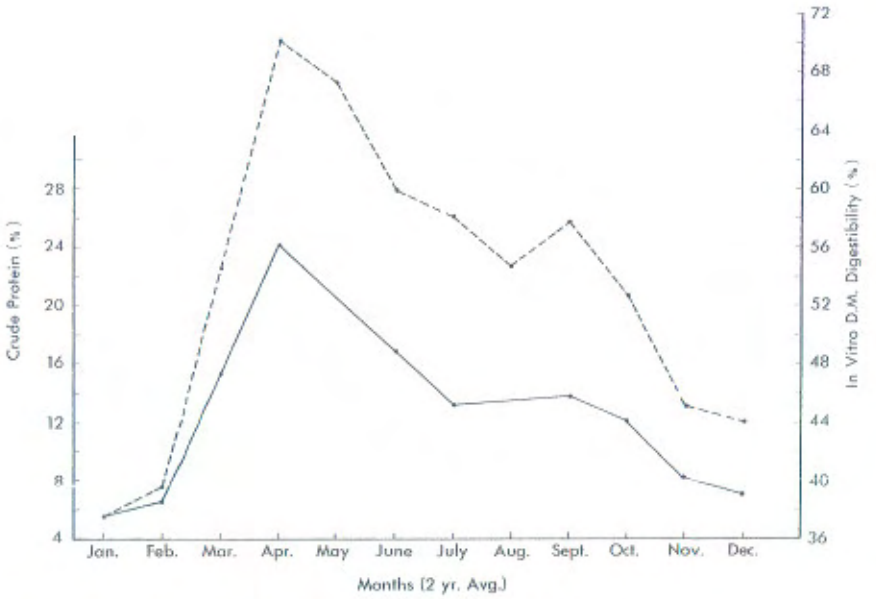

Figure 1. In vitro D.M. digestibility vs. crude protein.

Figures 1 and 2 show a positive relationship of crude protein and cell contents (NDS) to dry matter digestibility. Note the high values for all three in the early growing months of April, May and June. Dry matter digestibility, NDS and crude protein all decline rapidly from April to July. A rather high positive relationship between cell contents and dry matter digestibility should be expected since cell contents consist of materials which are almost completely digested. Cell-wall constituents, on the other hand, are rather low in digestibility.

Figures 3 and 4 show a negative relationship between dry matter digestibility and ADF and lignin. This is reasonable since fiber material is relatively low in digestibility and lignin is considered completely undigestible. Although the range in lignin content throughout the year is not great in terms of percent of dry matter, its effect upon digestibility is quite marked (Figure 4).

Table 2 and Figure 5 show the percentages of some of the minerals in bermudagrass. It is interesting to note that the curve for potassium (Figure 5) is similar in shape to that of *in vitro* dry matter digestibility (Figure 1). If we compare mineral content of the grass with requirements of different classes of cattle we find that it is adequate in the minerals shown for all classes of cattle during the

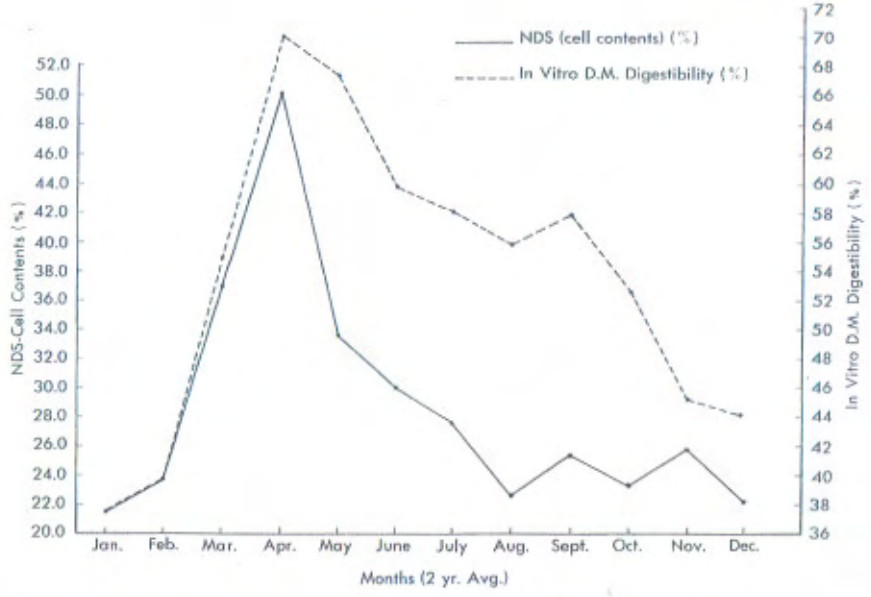

Figure 2. In vitro D.M. digestibility vs. NDS (cell contents).

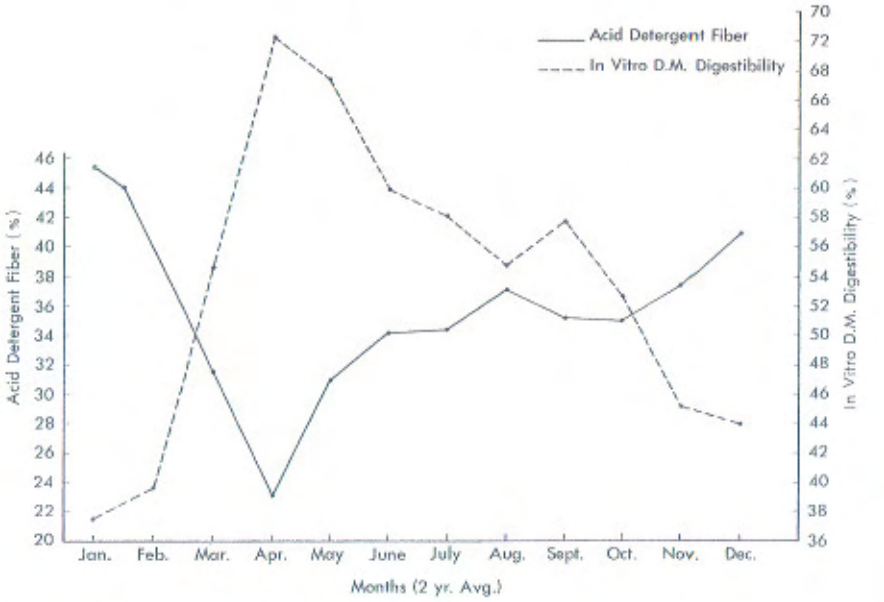

Figure 3. In vitro D.M. digestibility vs. acid detergent fiber.

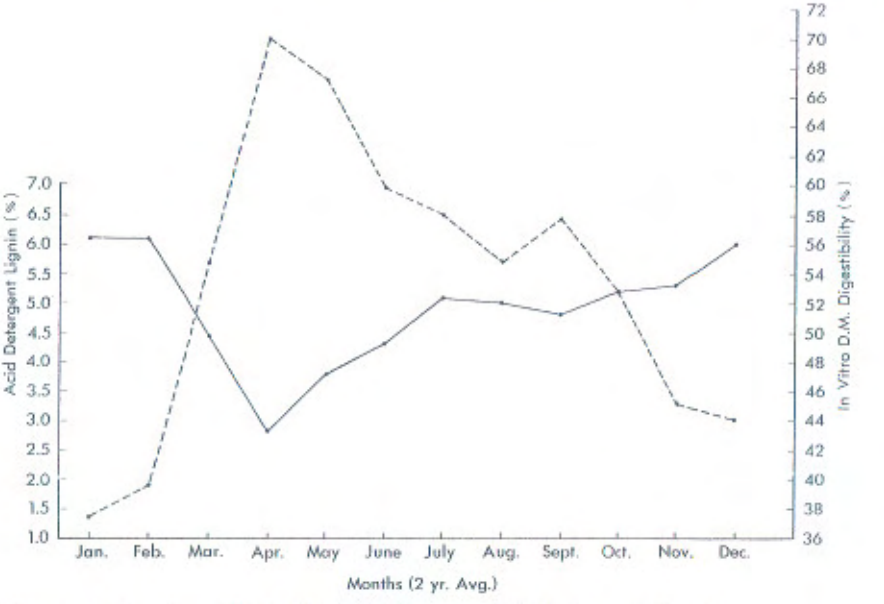

Figure 4. In vitro D.M. digestibility vs. acid detergent lignin.

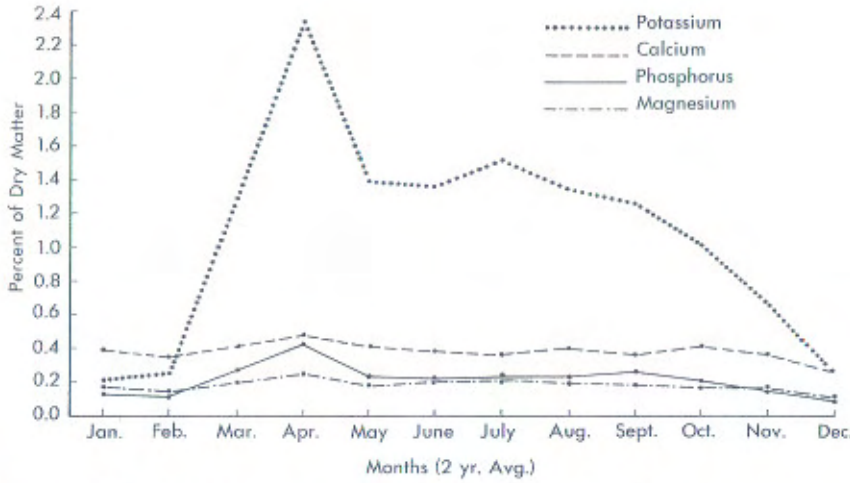

Figure 5. Seasonal variation in content of certain minerals.

Table 2. Seasonal Variation in Mineral Content of Midland Bermudagrass (2 Yr. Average)

Month	Calcium	Phosphorus	Magnesium	Potassium
	% of Dry Matter			
January	.39	.12	.17	.20
February	.35	.11	.14	.25
April	.48	.42	.25	2.34
May	.41	.23	.18	1.39
June	.38	.22	.20	1.36
July	.36	.23	.21	1.52
August	.40	.23	.19	1.35
September	.36	.26	.18	1.26
October	.41	.21	.17	1.02
November	.36	.14	.15	.69
December	.27	.09	.11	.25

growing season (April to October). During the winter months bermudagrass is definitely deficient in phosphorus and possibly some trace elements not shown.

When we consider the chemical composition and *in vitro* dry matter digestibility of Midland bermudagrass throughout the year we see that it is high in digestibility and low in fiber only during the spring and early summer months. Some forage specialists state that in order for a forage to be classed as "high quality forage" it must have a dry matter

digestibility of 65 percent or more. Thus, if this be true, bermudagrass is high in quality for only about 60 days of the year. This may explain the reason why young, growing cattle gain well during April, May and June but gain poorly during the remainder of the growing season. Furthermore, research has shown that forage intake increases as digestibility increases up to about 60 percent dry matter digestibility. Since digestibility of bermudagrass is below 60 percent except for April, May and June it is likely that cattle do not consume enough forage at other times to promote rapid gains.

Factors Influencing Muscle Fiber Variation

R. L. Henrickson and W. A. Gillis

Story in Brief

Skeletal muscle fibers vary greatly in size with respect to class of animal, muscle, and within muscle. These variations have been shown to be affected by specie, size, breed, sex, age, and level of nutrition. Postmortem influences on muscle fiber size, sarcomere length, percent kinky fibers and shear force have been shown to be influenced by rigor mortis, temperature, and muscle tension.

This investigation was designed to study the effect of four levels of muscle tension on the shear force of the semitendinosus and semimembranosus muscles. Levels of tension used were 0, 1000, 2500, 5000 gm.

Fiber size varied inversely with sarcomere length. No significant relationships were noted for fiber size and the percentage of kinky fibers.

Introduction

Skeletal muscle makes up approximately 40 percent of the live body weight of which approximately 75 percent is muscle fibers. Any variation as to quality and quantity of the muscle components can ultimately affect tenderness. The structure of muscle is a function of the relative amounts and kinds of the various component tissues. There-